STATEMENT BEFORE THE SUBCOMMITTEE ON REGULATIONS AND HEALTHCARE
U.S. HOUSE COMMITTEE ON SMALL BUSINESS

Hearing on the impacts of outstanding regulatory policy on
small biofuels producers and family farmers.
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Thank you, Chairwoman Velazquez and members of the subcommittee, for this opportunity to participate in today's hearing.

Our team of researchers and outreach/extension scientists at the University of Georgia works on various aspects of converting biomass to fuels and products. The university also has a larger group of scientists examining the fundamentals of plant biochemistry, genetics, breeding, and conversion processes. That group is made up of scientists from many disciplines including engineering, agricultural sciences, forestry, microbiology, carbohydrate chemistry and biochemistry. They strive to understand plant cell wall biochemistry and develop biomass and processes for second- and third-generation biofuels. Their work includes both very basic studies, and applied studies at the bench-scale and pilot scales.

Members of our team work directly with industry on technology transfer and implementation – taking the work from our labs to the marketplace where it can be used to benefit everyone.

The Energy Independence and Security Act (EISA) of 2007 is forward thinking legislation that has set an ambitious target of attaining 36 billion gallons of biofuels in our transportation fuel mix by 2022. Recent scientific publications on full lifecycle analysis warn that land use change to produce biomass would actually result in higher greenhouse gas (GHG) emissions in biofuels compared to gasoline (e.g. Searchinger et al., 2008; Fargione et al., 2008). Although some may disagree with the conclusions because the exact assumptions and emission factors used in these studies have not been widely validated, these studies do show the weakness in expanding a crop-based fuels strategy without sufficient planning for sustainability.

The EISA of 2007 specifies GHG emission reductions for advanced biofuels benchmarked to GHG emissions from gasoline. This is a good strategy, but will very likely slow the growth of the biofuels industry and reduce opportunities for small biofuels producers and family farms. If we continue to try to produce more biomass from the current spectrum of crop choices, GHG emission restrictions can disadvantage small producers and family farms.

Reduced GHG emissions require crops that are easier to grow, require lower inputs to grow (such as planting and harvesting costs, water, etc.), and are easier to process. In addition, the lowest GHG impacts come from using existing forestry and agriculture residues for biofuels.

Current corn ethanol production consumes roughly a quarter of the U.S. corn crop. Increasing ethanol production to the 15 billion-gallon-per-year target by 2022 will almost double the corn required. That increase will impact land and water needs, and create other environmental concerns. We need to improve the productivity of corn and other biofuels crops, and incorporate those improvements into the production process to reduce net inputs.

Producing lignocellulosic ethanol or other advanced biofuels (e.g. green diesel) is a challenge. Technology development in this field has advanced with support from the U.S. Department of Energy and private investments. However, most U.S. facilities are still in the early-demonstration phase and significant continued investment in research, development and deployment are required to achieve nationally set targets.

I believe these situations point to two focus areas that would satisfy the legislative intent of minimal environmental costs while creating opportunity for small business and farms: Using waste or residual biomass for biofuels production, and developing improved crops that provide high yields of biofuels with low inputs.

Significant waste biomass is generated in forestry and agriculture. According to the DOE and USDA's billion-ton vision report (Perlack et al., 2005), forestlands can produce 368 million dry tons of biomass annually – these include logging residues, fuelwood from forests, forest industry residues, and urban wood wastes. Both public and private forests can make important contributions to our biofuels strategy while improving the health of the forest, improving wildlife habitat and reducing occurrence of catastrophic wildfires that emit millions of tons of GHGs each year.

If renewable forest biomass is to compete in the biofuels industry, legislation must provide an inclusive definition of biomass with appropriate measures to maintain sustainability. Definitions significantly restricting most renewable forest biomass make this abundant resource off-limits to biofuels companies.

The University of Georgia's Warnell School of Forestry and Natural Resources has an active program to develop basic information related to costs and impacts of forest residue collection for biofuels (Baker et al., 2008; Greene and Das, 2006). Cost projections suggest that collecting residues and producing chips costs $11-12 per ton delivered to the mill without paying the landowner for stumpage. Chip properties do not significantly vary across treatments and residue chips have an average energy density of 19.1 MJ/kg_{dry}.

Based on the yield of chips and their nutrient content, maximum removal of nutrients were 23.5 lbs of N, 2.5 lbs of P, and 7.1 lbs of K from each acre. Lifecycle GHG assessment from use of forest waste to produce ethanol was reported to be 21.4 g-CO_2 eq/MJ, which is a 77 percent reduction compared to gasoline (CA-GREET, 2009). Increased use of these management practices can help create jobs in the forestry and biofuels sectors.

As we move forward to develop new and better biofuels, it is crucial that we have an available, diverse source of biomass feedstocks that don't compete with food supplies. Diversity allows different geographical regions to focus on crops best suited to local conditions. Current federal funding for research and development often targets a specific feedstock, hampering our ability to develop and transfer technology for novel crops.

In one recent study at the University of Georgia, researchers explored the use of a multi-benefit winter cover crop, oil seed radish, for its biofuels potential. Oil was extracted from the oil seed and converted into biodiesel while the crop served other agronomic functions. Additional income to the farm from the biodiesel production seems to show economic promise (Chammoun et al., 2009a; 2009b). Future regulatory policy could encourage similar crop development that may result in unexpected positive economic impacts on America's farms.

Many alternative crops are being explored at different degrees of depth and need continued study. Sorghum is one that has been studied at the University of Georgia over the last decade. UGA scientists led a global team in sequencing the sorghum genome (Paterson et al., 2009) and are now working toward understanding how we can use the genetic make up to our advantage in producing biofuels at lower costs in marginal soils.

Present work includes studying the large sorghum germplasm (over 360 lines) to understand specific physiological and biochemical features related to using sorghum biomass for second-generation biofuels. Specifically the enhanced ability to hydrolyze the biomass and produce a hydrolysate with minimal microbial toxicity will produce higher yields of ethanol at lower costs. Specific DNA markers generated from this study can be used as diagnostic tools to manipulate traits in accelerated breeding. Development of such drought resistant, robust crops with enhanced biofuels properties will help both farms and small biofuels producers in the future.

Specific target GHG reductions can also have the unintended consequence of eliminating certain technologies that have significant potential, but are lagging behind because of late starts (e.g. algae-biofuels). Current legislation and DOE policies also tend to narrow the field to selected biomass types or conversion processes. Anaerobic digestion, a fairly well-developed technology, is most often not considered because the energy output (methane gas) is not a liquid at room temperature. It is known that in a similar process, landfill bioreactors produce methane biogas which, when converted to compressed natural gas (CNG), has net GHG emissions less than 17 percent of that from an equivalent quantity of fossil-based CNG (CA-GREET, 2009).

Anaerobic digestion also can be farm based and can create jobs and produce net income to farms and small biofuels producers. University of Georgia researchers are developing a system that combines anaerobic digestion with algae production. The system can have multiple benefits such as using waste streams (including organic and nutrient rich agricultural and industrial byproducts), using CO_2 generated within the process or from external sources, and producing more than one type of biofuels (ethanol, biodiesel, and CNG) within an algae-biorefinery.

Current regulatory policies do not readily support developing such integrated solutions that are in the early stages of development. More rapid pilot-scale testing will help move these opportunities to the commercial sector quickly. The emphasis of federal agencies on large-scale demonstrations before detailed, pilot-scale research is completed, can impede development of such novel, integrated technologies.

Finally, recent interest in carbon sequestration is a welcomed change in national policy. It is clear that for continued economic growth and national security, we must transition to renewable forms of energy. However, our future challenge for greenhouse gas reduction will be removing CO_2 from the atmosphere. Current emphasis within the regulatory framework seems to favor carbon capture and storage through geological storage of compressed CO_2. Although potentially a reliable technique for carbon sequestration, this approach favors larger-scale sequestration and is likely very automated.

Creating jobs and increasing income to farms can only be achieved through simpler methods that are linked to agronomic processes. One example is using Biochar for soil carbon sequestration (UNCCD, 2008). Biochar is a byproduct of pyrolysis (a high temperature breakdown) of cellulosic materials, which produces a liquid hydrocarbon that could be converted to green diesel, other liquid fuels, and Biochar.

Biochar has high carbon content and is generally inert to biological degradation, so it could stay in the soil for many decades or longer. When implemented properly, this easily quantifiable Biochar soil carbon sequestration will increase the soil's carbon content, its agricultural productivity and sequester carbon for a long time. This could be an opportunity for small biofuels producers and family farmers to reap economic benefits while participating in carbon sequestration.

Although research is active in this area worldwide (including several projects at the University of Georgia), there is limited demonstration that will quantify benefits and identify obstacles early. The present regulatory framework does not appear to favor developing this technology.

There is great promise in the future of biofuels to augment our energy supply in this country. New ideas, technologies and discoveries are emerging from our universities and research centers almost every day.

Development and use of these discoveries could be accelerated by regulatory framework that supports deeper exploration into novel crops that don't pit the desire for fuel against the need for food. We need policies that encourage developing processes and technologies that help create jobs and income for farms and small businesses. And, we need support that allows us to investigate diverse feedstocks and low-cost, efficient production methods that protect and enhance the environment.

Close examination of current legislation reveals that, while it is very forward thinking, there are hidden, unintentional limitations that can keep many promising biofuels just beyond our reach. If we are to reach our ambitious goal of 36 billion gallons of biofuels in our transportation fuel mix by 2022 while reducing greenhouse gas emissions, all avenues of exploration must be open and barriers to development removed.

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